CHEM 2311
E1 practice iv

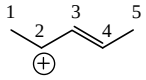
1. (32 points) Circle the letter *on the right* that corresponds to the answer to each question. There is only one correct answer for each question.

(i) Which of the following statements is *not* true about 1,3-butadiene?

A. it absorbs irradiation at a longer wavelength than 1-butene
B. it is stabilized by conjugation
C. it undergoes an addition reaction upon treatment with bromine
D. it undergoes an addition reaction upon treatment with water

A
B
C
D

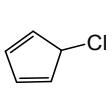
(ii) In the cation shown on the right, which carbon(s) is/are likely to form a bond with a nucleophile?



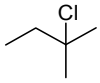
E. only 2 **F.** only 1 and 4 **G.** only 2 and 3 **H.** only 2 and 4

E
F
G
H

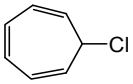
(iii) Which of the following undergoes the slowest hydrolysis (reaction with H_2O) to give an alcohol?



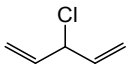
I.



J.



K.



L.

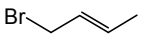
I
J
K
L

(iv) Which of the following statements is *not* true regarding the Diels-Alder reaction?

M. the *endo* transition state is preferred
N. the stereochemistry of the product depends on the stereochemistry of the starting materials
O. the diene must adopt an s-*trans* conformation
P. electron-withdrawing groups on the dienophile increase the rate of reaction

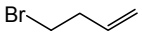
M
N
O
P

(v) Which of the following is the kinetic product of the addition HBr to 1,3-butadiene?



Q.

R.



S.

T.

Q
R
S
T

(vi) Which of the following is not a characteristic of aromatic compounds?

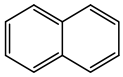
U. 4n + 2 π electrons **V.** they are especially stable
W. they react like alkenes **X.** they have a cyclic array of p orbitals

U
V
W
X

(vii) Which of the following is antiaromatic?

Y.

Z.



AA.

BB.

Y
Z
AA
BB

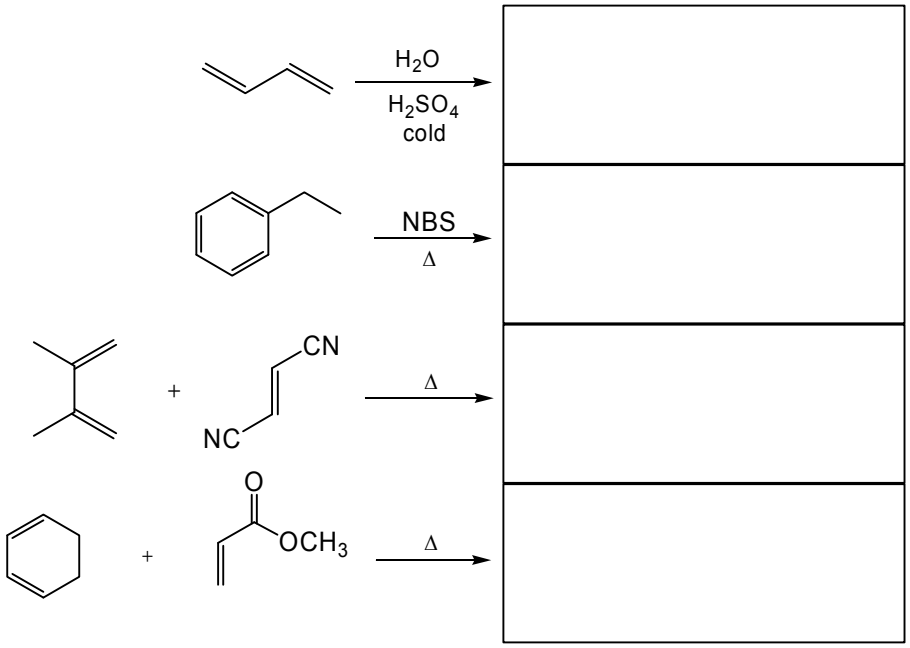
(viii) What kind of ring is formed in a Diels-Alder reaction?

CC. cyclobutadiene **DD.** cyclohexene **EE.** cyclopentane **FF.** aromatic

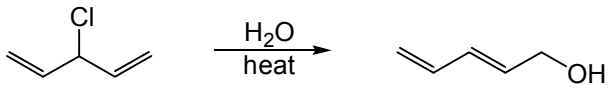
CC
DD
EE
FF

2. (38 points)

(a) (20 pts) Provide the structure of the major organic product obtained from each of the following reactions. Indicate the stereochemistry of the products wherever appropriate



(b) (18 pts) (i) Draw a detailed stepwise mechanism for the following reaction, including all low energy resonance contributors of resonance-stabilized intermediates. Use curved arrows to show the movement of electrons.



(ii) Provide a concise explanation (one sentence) of why the product of the reaction is 2,4-pentadien-1-ol, and that 1,4-pentadien-3-ol is *not* formed.

3. (30 points) The following transformations cannot be completed in a single step. Provide a sequence of reactions to perform each transformation, showing the reagents and structures of *all isolated synthetic intermediates*. The synthesis must use the given starting materials; you may also use any other starting materials with *3 or fewer* carbon atoms. You may use any reagents. Do *not* show mechanisms or the structures of reactive intermediates. Shorter, more efficient syntheses are preferred; overly long or inefficient sequences will lose some credit.